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Energy generation potential from coals of the Charqueadas Coalfield, RS, Brazil

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Three coal seams, I2B (Inferior 2), I1F (Inferior 1) and MB, from the Charqueadas Coalfield located in the central-east region of the State of Rio Grande do Sul, Southern Brazil were studied on the basis of geological, petrographic, chemical and geochemical techniques and correlated to the SR1, SR2 and SR3 coal seams from the Santa Rita Coalfield. The Charqueadas Coalfield reserves reach 2,993x106 metric tons of coal distributed in six coal seams. The study of sedimentary and organic facies is made on the subsurface data from five boreholes drilled in the area. There show a well marked lateral facies change from sub aquatic to sub aerial environment, conditioned by both the water level variations and the irregular palaeotopography of the basement. The coals change from limnic to forest-terrestrial moor types characterized by variations of composition in terms of macerals, microlithotypes and mineral matter. The coals are rich in mineral matter (28 to 40%); the vitrinite content reaches 50 %, inertinite 44 % and liptinite varies from 10 to 30 %, in mineral matter free basis. Among the microlithotypes carbominerite and vitrite are predominant. Rank studies carried out by different methods (vitrinite reflectance, max and red-green quotient among others) gave conflicting results, which are explained by the strong bituminization of the vitrinite. However, agreement between fluorescence measurements and organic geochemical parameters (e.g. CPI values) confirm that the coals are of a High Volatile Bituminous B/C (ASTM) or Gasflammkohle (DIN) rank. Based on these characteristics, the Charqueadas coal seams show great potential for use in Underground Coal Gasification (UCG) and Enhanced Coalbed Methane (ECBM) projects. Nowadays the state of Rio Grande do Sul is rapidly growing and needs to increase the energy efficiency to attend the industrial demands, filling the gap between supply and energy generation. As with conventional IGCC, UCG gas can be used to generate electricity with efficiency as high as 55% and overall UCG-IGCC process efficiency reaching 43%. Regarding to environmental problems the UCG minimize environmental impacts (waste piles/acid mine drainage) and reduce CO2 emissions because syngas contains CO2 that can be captured with relatively low-energy penalty. The Clean Coal Technologies (CCT), especially UCG and ECBM projects, will be a key factor to maintain the annual state's economy expansion associated with energy efficiency improvement programs.